1 High Fidelity Rover Dynamics

$$\begin{bmatrix} \dot{x} \\ \dot{y} \\ \dot{\psi} \\ \dot{v_x} \end{bmatrix} = \begin{bmatrix} v_x \cos(\psi) - v_y \sin(\psi) \\ v_x \sin(\psi) + v_y \cos(\psi) \\ \frac{\tan(c_1 \delta^{cmd} + c_2) v_x}{c_3 + c_4 {v_x}^2} \\ c_5 + c_6(v_x - {v_x}^{cmd}) + c_7(v_x - {v_x}^{cmd})^2 \end{bmatrix}, u = \begin{bmatrix} {v_x}^{cmd} \\ \delta^{cmd} \end{bmatrix}$$

where $v_y = \dot{\psi}(c_8 + c_9 {v_x}^2)$

and

$c_1 = 1.6615e-05,\ c_2 = -1.9555e-07,\ c_3 = 3.6190e-06,\ c_4 = 4.3820e-07,\ c_5 = -0.0811,\ c_6 = -1.4736,\ c_7 = 0.1257,\ c_8 = 0.0765,\ c_9 = -0.0140$

2 Low Fidelity Rover Dynamics

$$\begin{bmatrix} \dot{x} \\ \dot{y} \end{bmatrix} = \begin{bmatrix} v_x^{cmd} - \omega y \\ \omega x \end{bmatrix}, u = \begin{bmatrix} {v_x}^{cmd} \\ \delta^{cmd} \end{bmatrix}$$

where $\omega = \frac{v_x^{cmd} \delta^{cmd}}{b}$

and $b = 0.32$